Before the image data is ever loaded when a JPEG image is selected for viewing the markers must be read. In a JPEG image, the very first marker is the SOI, or Start Of Image, marker. This is the first "hey, I'm a JPEG" declaration by the file. The JPEG standard, as written by the Joint Picture Expert's Group, specified the JPEG interchange format. This format had several shortcomings for which the JFIF (JPEG File Interchange Format) was an attempted remedy. The JFIF is the format used by almost all JPEG file readers/writers. It tells the image readers, "Hey, I'm a JPEG that almost anyone can understand."

Most markers will have additional information following them. When this is the case, the marker and its associated information is referred to as a "header." In a header the marker is immediately followed by two bytes that indicate the length of the information, in bytes, that the header contains. The two bytes that indicate the length are always included in that count.

A marker is prefixed by FF (hexadecimal). The marker/header information that follows does not specify all known markers, just the essential ones for baseline JPEG.

A component is a specific color channel in an image. For instance, an RGB image contains three components; Red, Green, and Blue.

Start of Image (SOI) marker -- two bytes (FFD8)

JFIF marker (FFE0)

- length -- two bytes
- identifier -- five bytes: 4A, 46, 49, 46, 00 (the ASCII code equivalent of a zero terminated "JFIF" string)
- version -- two bytes: often 01, 02
    - the most significant byte is used for major revisions
    - the least significant byte for minor revisions

- units -- one byte: Units for the X and Y densities
    - 0 => no units, X and Y specify the pixel aspect ratio
    - 1 => X and Y are dots per inch
    - 2 => X and Y are dots per cm
- Xdensity -- two bytes
- Ydensity -- two bytes
- Xthumbnail -- one byte: 0 = no thumbnail
- Ythumbnail -- one byte: 0 = no thumbnail
- (RGB)n -- 3n bytes: packed (24-bit) RGB values for the thumbnail pixels, n = Xthumbnail * Ythumbnail

Define Quantization table marker (FFDB)

- the first two bytes, the length, after the marker indicate the number of bytes, including the two length bytes, that this header contains
- until the length is exhausted (loads two quantization tables for baseline JPEG)
    - the precision and the quantization table index -- one byte: precision is specified by the higher four bits and index is specified by the lower four bits
        - precision in this case is either 0 or 1 and indicates the precision of the quantized values; 8-bit (baseline) for 0 and up to 16-bit for 1
    - the quantization values -- 64 bytes
        - the quantization tables are stored in zigzag format

Define Huffman table marker (FFC4)

- the first two bytes, the length, after the marker indicate the number of bytes, including the two length bytes, that this header contains
- until length is exhausted (usually four Huffman tables)
  - index -- one byte: if >15 (i.e. 0x10 or more) then an AC table, otherwise a DC table
  - bits -- 16 bytes
  - Huffman values -- # of bytes = the sum of the previous 16 bytes

Start of frame marker (FFC0)

- the first two bytes, the length, after the marker indicate the number of bytes, including the two length bytes, that this header contains
- P -- one byte: sample precision in bits (usually 8, for baseline JPEG)
- Y -- two bytes
- X -- two bytes
- Nf -- one byte: the number of components in the image
  - 3 for color baseline JPEG images
  - 1 for grayscale baseline JPEG images

- Nf times:
  - Component ID -- one byte
  - H and V sampling factors -- one byte: H is first four bits and V is second four bits
  - Quantization table number-- one byte

The H and V sampling factors dictate the final size of the component they are associated with. For instance, the color space defaults to YCbCr and the H and V sampling factors for each component, Y, Cb, and Cr, default to 2, 1, and 1, respectively (2 for both H and V of the Y component, etc.) in the Jpeg-6a library by the Independent Jpeg Group. While this does mean that the Y component will be twice the size of the other two components-- giving it a higher resolution, the lower resolution components are quartered in size during compression in order to achieve this difference. Thus, the Cb and Cr components must be quadrupled in size during decompression.

Start of Scan marker (FFDA)

- the first two bytes, the length, after the marker indicate the number of bytes, including the two length bytes, that this header contains
- Number of components, n -- one byte: the number of components in this scan
- n times:
  - Component ID -- one byte
  - DC and AC table numbers -- one byte: DC # is first four bits and AC # is last four bits
- S_s -- one byte
- S_e -- one byte
- A_h and A_l -- one byte

Comment marker (FFFE)

- the first two bytes, the length, after the marker indicate the number of bytes, including the two length bytes, that this header contains
- whatever the user wants

End of Image (EOI) marker (FFD9)
- the very last marker